

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Method of Preparing Moulds to Produce Crackle and other Surface Finishes on Moulded Plastic Articles

We, CONSOLIDATED MOULDED PRODUCTS CORPORATION, a corporation organized under the laws of the State of Delaware United States of America, of 1740, Broadway, New York, New York, the United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to moulds for plastic articles and to methods of making such moulds and it relates more particularly to methods of preparing moulds to produce crackle, wrinkle, crystal and other texture finishes on moulded plastic articles and to the resulting moulds.

The use of texture finishes on metallic articles such as typewriters and other business machines, cabinets for electronic equipment and the like is widespread. In some instances, the use of a textured finish such as a crystal or crackle finish, together with a selected colour identifies the products with the manufacture so that to some extent the surface finish and colour has acquired a meaning which indicates the origin of the goods.

It has been found that many of the metallic parts of business machines and the like can be formed more economically of plastic than of metal and the plastic parts are equally serviceable under ordinary conditions of use. However, it is difficult to obtain the proper finish on the plastic parts with the use of the conventional texture enamels, lacquers or paints (referred to hereinafter as texture enamel) and, moreover, the finishing operations involved minimize to a degree the price differential between the plastic and metallic parts.

Efforts have been made to provide moulds which are capable of moulding on

the surface of plastic articles or parts thereof a finish which corresponds to the desired texture finish provided by texture enamel. However, even the best engraving and tooling procedures have not been able to produce an exact duplicate of a texture finish and moreover the cost of the preparation of such moulds is prohibitive.

The present invention relates to a simplified and economical method of producing moulds which are capable of forming texture finishes on the surface or surfaces of plastic articles which are indistinguishable from the finishes which are produced with texture enamel. More particularly, the method involves the preparation of a model of the article to be produced, this model forming the basis for the production of the desired mould. The article is then painted with a texture enamel, and baked or otherwise treated to produce the desired texture surface finish. The article is treated to render its surfaces electrically conductive and it is then electroplated. Inasmuch as the finished mould may be subjected to high pressures and temperatures in use, the metal which is plated on the model preferably is a hard metal such as iron or nickel. The plating is carried on until a shell of substantial thickness is formed. After the shell has formed, it is removed by heating it to expand and free it from the model. The resulting shell has a surface which is complementary to the textured finish on the model and thus is capable of duplicating the surface finish of the model when used in a moulding operation. If the shell is of substantial thickness, it may be used without re-inforcement by mounting it suitably in the moulding apparatus. However, it is preferred to mount the shell in a metal backing formed of iron or steel which is shrunk to the

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shell to strengthen and reinforce it. Such a reinforced mould is capable of withstanding the high pressures and temperatures encountered in plastic moulding apparatus.

By producing the moulds in the manner described, it is possible to obtain more faithful reproductions of textured surfaces than is possible with engraving and etching operations.

For a better understanding of the present invention, reference may be had to the accompanying drawing, in which:

Figures 1, 2 and 3 disclose successive steps in the manufacture of a mould shell; and

Figure 4 is a view in section through a typical mould embodying the present invention.

The invention will be described with respect to the production of a mould for reproducing an article 10, such as that shown in Figure 1 of the drawings which is generally frusto-conical in shape and to which is imparted a textured finish, such as that produced with texture enamel. Texture enamels are normally liquid and can be applied with a brush or a spray gun. When they are allowed to dry or are caused to dry by heating them, they harden and form a tough surface film which has a characteristic crinkly or crystalline finish. The model 10 may be formed of almost any type of material which is capable of withstanding a temperature of the order of 250° F. which is above the normal baking temperature for texture enamels.

The first step in the operation is to spray the model 10 with a texture enamel thinned to the proper consistency. Inasmuch as such spraying techniques and texture enamels are well known, further description of this operation is unnecessary.

When a uniform heavy wet coat of the texture enamel has been applied to the model 10, the enamel is allowed to air dry for about three minutes to set the coating. The coated article is then transferred to a baking oven where it is baked for about two hours at about 225° so as to harden the enamel and to produce the desired texture, i.e., crackle, crystal or wrinkle. The temperature and time of baking will, of course, vary depending upon the type of texture enamel used. The minimum thickness of the finish should be not substantially less than 0.0035 inch after thorough drying and baking. The next step in the operation is to put the model in condition for electroplating. Inasmuch as the texture surface 11 of the article is non-conductive, it must be rendered conductive in order

to electro-deposit a metal thereon. To this end, the model is washed thoroughly in a dilute stannous chloride solution and thereafter sprayed with 20% silver nitrate solution and dried to render the surface 11 conductive.

The model 10 is immersed in an acid copper plating solution and given a flash coating of copper. The copper plating operation is conventional. A flash coating of copper can be deposited on the model in about a half hour. The copper plate conforms accurately to the texture and configuration of the model 10 and its texture surface 11. The model is then transferred to another plating tank where another heavier layer of metal 12 is plated on the model to form a shell 13. The metal 12 deposited in this tank may be iron or nickel inasmuch as both of these metals are hard and capable of withstanding the moulding temperatures and pressures used in plastic moulding operations.

A typical nickel plating solution which gives good results may, in about the following proportions, consist of:—

Nickel ammonium sulphate	25½ oz.	
Ammonium sulphate	- - -	8 oz.
Crystallized citric acid	- - -	1½ oz.
Water	- - - - -	10 to 12 qts.

The nickel may be deposited on the copper layer on the model as the cathode from this bath at a current density of about 0.34 amperes per square cm. and about 2.0 to 2.2 volts with about 10 centimetres anode cathode spacing.

A shell of iron may be electro-deposited on the model from a bath containing in about the following proportions:—

Ferrous ammonium sulphate	- 1½ oz.	
Crystallized citric acid	- - -	0.88 oz.
Water	- - - - -	1 qt.

and sufficient ammonia to produce a neutral or slightly acid reaction.

The iron can be deposited on the copper surface of the model 10 at a cathode density of about 0.3 ampere per square centimetre and about 2 volts at an electrode spacing of about 10 centimetres.

The electroplating operation is continued until a shell 13 of substantial thickness is deposited on the copper plated surface of the model 10. Preferably, electroplating should be continued until the shell has attained the thickness of a minimum of about one-eighth of an inch, as shown in Fig. 3.

After the shell 13 has been deposited to the desired thickness, the plated model is removed from the plating tank and the shell 13 is heated slightly to expand it and release it from the model 10. If any of the texture enamel adheres to the inner surface of the shell, it can be removed

with paint thinner or the like. The copper flashed surface of the shell in contact with the model will be a faithful reproduction of the texture of the surface of the model.

- 5 Under some conditions, as for example, when the moulding pressures used in the preparation of plastic articles are low, the shell 13 is strong enough in itself to be used directly as a mould, without reinforcement. However, when the shell 13 is of the order of about $\frac{1}{8}$ inch thick, it may be desirable to provide a backing for the shell, especially when it is to be subjected to high moulding pressures. As shown in Fig. 4, the shell can be mounted in a hollowed out block of steel 14, or other strong material which is shrunk on, or otherwise secured to the shell. It will be understood, that the backing block 14 may be provided with the usual sprue groove 15 or passage and keyways 16 or openings for receiving aligning and locating pins on the press as may be required.

- 25 The method described above can be used for producing moulds to give an all over textured finish to the moulded plastic articles or they may be produced to give in part a texture finish and, in part, a smooth finish, as desired, by suitably painting, enamelling or lacquering the model. Thus, for example, etched effects can be imparted to translucent or opaque plastic articles by painting or printing localized areas of a model with texture finishes. In this way plastic articles having engraved or etched designs, monograms, lettering and the like or substantially any type of finely textured surface can be produced without expensive and time consuming engraving, etching and the like on the model or the finished plastic articles.

- 45 While it is preferred to form a shell of nickel or iron, it will be understood that other metals which are commonly electroplated, may be used with equally satisfactory results. Therefore, the example of the invention described above

should be considered as illustrative and not as limiting the scope of the following 50 claims.

What we claim is:—

1. A method of making a mould having a textured moulding surface, comprising applying to the surface of an article a 55 coating of texture enamel, treating the enamel to develop its texture, rendering the textured surface of the article conductive, and electroplating the textured surface of the article to form a mould 60 shell having a surface complementary to said textured surface.

2. A method as claimed in Claim 1, in which the textured surface is rendered conductive by applying a conductive 65 material to said surface.

3. A method as claimed in Claim 2, in which the metal is electro-deposited to form a shell at least one-eighth of an inch 70 thick.

4. A method as claimed in any one of the preceding claims, in which the shell is mounted in a rigid backing support to provide a composite mould capable of withstanding high moulding pressures. 75

5. A method of making a mould having a textured moulding surface substantially as described with reference to the accompanying drawings.

6. A mould comprising a metallic shell 80 of substantial thickness having a textured moulding surface produced in accordance with the method claimed in Claim 3.

7. A mould comprising a metallic shell 85 of substantial thickness having a textured moulding surface and a rigid backing support thereon produced in accordance with the method claimed in Claim 4.

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FIG.1.

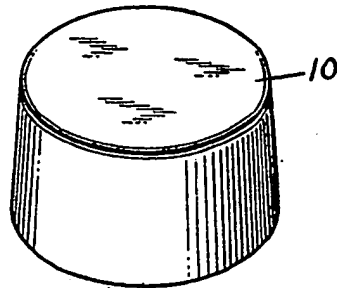


FIG.2.

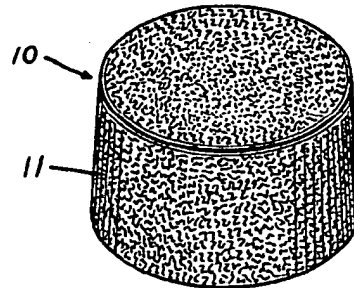


FIG.3.

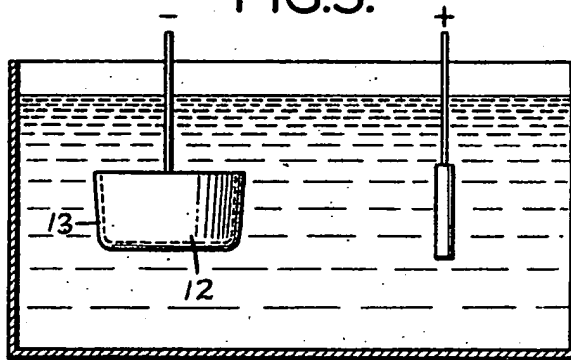


FIG.4.

